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54. Name of Invention VERTEBRAL BODY SPACER

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57. Area covered by the Patent Request

1. A vertebral body spacer that is block-shaped, made of material that is secure and provides affinity inside the body, and is anti-corrosive; has a protrusion at both the top and bottom surfaces; and both the top and bottom surfaces are slanted from the protrusion toward the back, to form a wedge-shape.

Detailed Description of the Invention

This invention involves substitute bones for transplantation, especially aimed at providing vertebral body spacers which will replace especially the intervertebral disc of the spinal column.

Between the vertebral body of the spinal column is an intervertebral disc that is made of cartilage, which may be removed due to symptoms such as hernia of the intervertebral disc. When this happens, it is necessary to prepare a substitute. Currently, a part of the bone is extracted from another part of the body and transplanted, but this unfortunately requires a separate surgery to extract that bone which is to be transplanted.

This invention aims to provide a vertebral body spacer that will substitute for the intervertebral disc from living bones.

Another goal of this invention is to provide a vertebral body spacer that is simple to set in place, will not slip out of place or come off, and will last a long time.

According to this invention, we can obtain a vertebral body spacer whose characteristic is one that is block-shaped, made of material that is secure and provides affinity inside the body, and is anti-corrosive; has a hole that passes through the front and back; has protrusions at both the top and bottom surfaces; and both the top and bottom surfaces are slanted from the protrusion toward the back, to form a wedge-shape.

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This vertebral body spacer is to be substituted for an intervertebral disc, where the top and bottom surfaces of the vertebral body is placed in opposition to one another; and the front area of the protrusion at both top and bottom should contact the vertebral body surface above and below it in order to maintain the space between the top and bottom vertebral bodies. This spacer is slanted like a wedge toward the back, at both top and bottom; therefore, during implantation, by forming an indentation at the opposing vertebral bodies at the top and bottom, the protruded area of the spacer will fit into this indentation, whereby preventing the spacer from coming out after implantation.

Spacer material come in ceramic, plastic, rubber, and metal; and one can choose that which is secure and provides affinity inside the body, and is anti-corrosive. Representative examples include: for ceramic -- alumina ceramic and phosphoric acid calcium ceramic; and for metal -- titanium, stainless steel, cobalt chrome alloy, and tantalum.

See below for a detailed explanation, with drawings that illustrate an implementation sample of this invention.

In Diagram 1, the indicated vertebral body spacer 1 is, for instance, made of a rough hexahedron block which is shaped from alumina ceramic, and the front surface 2 and back surface 3 are more or less parallel, and a hole 4 passes right through them. At the top and bottom surfaces of this block-shaped vertebral body spacer 1 there are protrusions 5 and 6 on each, which extend from one side to the other. Here, in protrusion 5, the cross section is shaped like a mountain, a rough triangle; and in protrusion 6, the outer shape of the cross-section is either semi-circular, or has some other form of rounded shape. Areas 7 and 8, which are in front of protrusions 5 and 6 at both top and bottom surfaces, are more or less parallel to each other; and areas 9 and 10, which are in back of...

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...protrusions 5 and 6, are wedge-shaped, forming a slant that approaches each other towards the back. Furthermore, both the left and right surfaces, 11 and 12 which are forward with respect to the position of protrusions 5 and 6, are parallel to each other; and rear surfaces 13 and 14 are wedge-shaped, having slanted surfaces that approach each other towards the back.

The following is an explanation of a sample with vertebral body spacer 1, using Diagram 2 and Diagram 3.

First of all, the intervertebral disc 21 at the location where vertebral body spacer 1 is to be applied, as well as vertebral bodies 22 and 23 which are above and below it, should be shaved off a little at a time from the front, to form space 24 that will plug up vertebral body spacer 1. In doing so, it is best to make the shape of space 24 bigger than the outer shape of vertebral body spacer 1, but the outer shape of the front end of the space must match the outer shape of the front part of vertebral body spacer 1 in its proper position, and it is necessary to form indentations 25 and 26 which will receive protrusions 5 and 6.

After forming space 24, expand the space of vertebral bodies 22 and 23 by using a "vertebral body space expander," and insert vertebral body spacer 1 into space 24, with the back surface 3 going in first. In doing so, insert the triangular protrusion 5 into the corresponding indentation 25. Then, when spacer 1 is pushed in from the front, the round protrusion 6 should slide over the back vertebral body 23, and fit into indentation 26.

In this manner, vertebral body spacer 1 should be set in between vertebral bodies 22 and 23, in a condition where the forward space surfaces of the top and bottom vertebral bodies 22 and 23 are contacting the front areas of the top and bottom surfaces of vertebral body spacer 1 (see Diagram 1, 7 and 8), whereby maintaining proper position between the top and bottom vertebral bodies 22 and 23. At the same time, top and bottom protrusions 5 and 6 should be inserted into indentations 25 and 26, whereby preventing vertebral body spacer 1 from falling off in the future. This condition is shown in Diagram 3. Furthermore, the penetrating hole 4 of vertebral body spacer 1 will act as a type of drain that will discharge liquids, such as blood which may leak from the back of the space after implantation, to the front.

Adding texture (linear streaks) 15 and 16 to the surface of the vertebral body spacer, as shown in Diagram 4, will help maintain the connection of the vertebral body spacer surface to the vertebral body and intervertebral disc, due to such changes as...

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...bone recycling and increase after implantation, thus adding to the security and maintenance of the vertebral body spacer.

As for each of the various measurements of the vertebral body spacer, such as the cervical vertebrae, thoracic vertebrae, and lumbar vertebrae, simply make the appropriate choice that corresponds to the measurement of the vertebral body and intervertebral disc of the applicable part.

Above was an explanation of a specific implementation sample of this invention. However, this invention is not limited to this particular implementation sample, but there are many transformations possible. For instance, protrusions 5 and 6 do not necessarily have to be triangular or round, respectively. As long as these act as stoppers after implantation, other shapes may be used. Also, these protrusions do not have to be one continuous line from left to right, but may be several noncontinuous lines, or simple multiple protrusions that are lined up left and right, as long as they achieve their purposes.

Furthermore, the penetrating hole for the drain can be round, or any other shape, and there may be many of them.

Also, the surface of the vertebral body spacer may not necessarily be composed of parallel flat areas 11 and 12, and slanted surfaces 13 and 14, as shown in Diagram 1, but may instead be flat surfaces, or when considering bone proliferation, it may be curved, or even uneven.

As it is clear from what has been explained above, according to this invention, extraction of a bone to be transplanted by means of intervertebral disc surgery becomes unnecessary, and it can be implanted securely by simply placing it in between the vertebral bodies. It will be preserved between the vertebral bodies, and will last a long time after implantation, preventing any off-centering or detachment from occurring between the vertebral bodies.

A Simple Explanation of the Diagrams

Diagram 1 shows one implementation sample of this vertebral body spacer invention: Diagram (a) is a plane view, Diagram (b) is the left surface, Diagram (c) is the frontal view. Diagram 2 shows the vertebral bodies of those parts to which the vertebral body spacer is applied, as well as explains the formation surgery of the intervertebral disc: Diagram (a) is the frontal view, Diagram (b) is the cross-section. Diagram 3 shows the cross-section when the vertebral body spacer is implanted. Diagram 4 shows a diagonal external view of another implementation sample.

1... vertebral body spacer, 2 ... frontal view, 3 ... rear view, 4 ... penetrating hole, 5 and 6 ... protrusions, 7 & 8 ... frontal parallel area, 9 & 10 ... rear slanted area.